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COST EFFECTIVENESS AND COST BENEFIT ANALYSIS OF SUBSTANCE ABUSE TREATMENT: A LITERATURE REVIEW

June 2002

CSAT
Center for Substance Abuse Treatment
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CSAT Center for Substance Abuse Treatment SAMHSA

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FOREWORD

The Center for Substance Abuse Treatment (CSAT) Office of Evaluation, Scientific Analysis and Synthesis (OESAS) established the original National Evaluation Data Services (NEDS) contract (Contract No. 270-97-7016) in 1997 to support the CSAT mission by increasing evidence-based knowledge of the effectiveness of substance abuse treatment and promoting access to treatment evaluation and analysis data and findings. NEDS furnished that support by supplying data management, scientific analyses, and technical support services.

In 2000, through a new contract (Contract No. 270-00-7078), OESAS both continued and expanded the scope of NEDS in three major areas: treatment data infrastructure, secondary analysis of treatment data including Government Performance and Results Act support, and Web-based treatment data tools for states. NEDS is designed to give the Center the capability to strategically target, acquire, and access existing data from CSAT and other data sources, to generate new treatment information over time through analyses of the available data, and to provide access to this new treatment information to diverse audiences through multiple product lines and avenues. All of these activities are aided throughout by the active participation of a preeminent panel of experts representing diverse constituencies from the field of substance abuse treatment.

This literature review synthesizes and presents the major findings of studies focusing on the cost effectiveness and cost benefits of substance abuse treatment. Evaluating the outcomes and costs of treatment is important in order to determine how to more efficiently allocate scarce resources. This review highlights trends and identifies areas where there are gaps in the literature for multiple audiences, including providers, policymakers and researchers/evaluators. The purpose of this document is to assist professionals within the substance abuse treatment community with their ongoing determination of effective delivery of treatment services.

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ABSTRACT

This literature review summarizes the major findings from books, published articles, research and evaluation studies, and government documents (including "Web" publications) published since 1980, which focus on the cost effectiveness and cost benefits of substance abuse treatment. Cost effectiveness and cost benefit studies play an important role in evaluating existing and alternative substance abuse approaches and in assessing new treatment methods. Evaluating the outcomes and costs of treatment is necessary in order to determine how to more efficiently allocate scarce resources. This document is intended to assist policymakers, researchers/evaluators, and treatment providers interested in this field to identify and acquire evidence-based information specific to their interests. Policymakers and researchers/evaluators can use this information to help inform decisions of whether or not an increase in effectiveness justifies an increase in cost of a particular treatment. Treatment providers need this information when they seek funding from public agencies. This review also explores trends and areas where there are gaps in the literature. A companion annotated bibliography, *Cost Effectiveness and Cost Benefit Analysis of Substance Abuse Treatment: An Annotated Bibliography*, is also available on the NEDS Web site (http://neds.calib.com).

EXECUTIVE SUMMARY

1. INTRODUCTION

Treatment providers, policymakers and payers are constantly faced with the question of how to use limited resources in order to yield the greatest client as well as social benefits. While it is intuitive that any treatment that both improves outcomes and reduces cost should be made available, providers, treatment purchasers and policymakers are more often faced with the decision of whether or not to adapt a more costly and more effective treatment than what is currently being offered. Therefore, it is important for them to have evidence-based information to help inform decisions of whether or not an increase in effectiveness justifies an increase in cost of a particular treatment.

Cost and economic analysis play an important role in evaluating existing substance abuse treatment approaches and in designing new treatment methods. The objectives of this literature review are to (1) broadly characterize and summarize the major findings of cost effectiveness and cost benefit studies, and (2) succinctly summarize the conclusions offered by the studies. The summary discussion frames the conclusions in balance with analytic issues and the general level of conclusiveness of the findings, based on the rigor of the study design, data and analyses.

2. APPROACH

This literature review identifies and synthesizes the results of the substance abuse cost benefit and cost effectiveness literature that has been published since 1980. This literature review includes books, published articles and research/evaluation studies and government documents (including Web publications). A broad and comprehensive search of the literature was conducted including a search of nine comprehensive electronic databases and selected government Web sites. Additionally, the reference lists of the acquired documents were manually reviewed to identify further literature.

Publications were included in this literature review if they reported on studies that were "data" based and/or presented cost effectiveness or cost benefit data. Methodology reports and literature reviews were not included. A total of 58 documents met the inclusion criteria and were included in this review. In order to characterize this literature, information was abstracted from each document across a number of indicators, including the type of cost/economic study, the levels of care, types of treatment cost measures, sociodemographic characteristics of treated population, sources of cost data and the types of outcomes/benefits studied.

3. FINDINGS

The findings presented in this literature review are organized to provide answers to three types of evaluation questions that can be addressed from an economic perspective. These include: "Is some/any treatment better than no treatment?" "Are some types of treatment better than other types?" and "Are various approaches/components of treatment better than others?" Cost effectiveness findings for several distinct treatment populations are also presented.

Several cost benefit studies examining a broad scope of client behavior changes and associated economic impacts have shown that the benefits (e.g., improvements in crime, health, and social functioning) are consistently greater than and often are many times larger than the costs of substance abuse treatment. Most of the benefits from these studies have been from reductions in crime and improvements in employment/productivity. There have also been several studies that have analyzed the economic benefits of substance abuse treatment in terms of reduced health care utilization and costs (cost offsets). These studies of populations with health insurance consistently find that health costs and utilization rise dramatically prior to initiation of substance abuse treatment and fall dramatically following the treatment period.

The questions of what kind of substance abuse treatment to recommend for clients is an issue for many managers of provider organizations and purchasers of services. The economic literature has produced several studies that conclude that less expensive treatment approaches are often more cost effective or cost beneficial than more expensive approaches. These studies compare the outcomes of clients getting alternative levels of care and find that their outcomes/results are similar, however the costs of the two are quite divergent, giving preference to the low cost approach, which is generally less intensive.

A number of studies have been conducted to understand whether particular enhancements or approaches to substance abuse treatment are more cost effective or cost beneficial. Most of the studies conducted in this area have focused on ambulatory treatment. Length of stay in treatment has been the most analyzed improvement. Each of the studies that analyzed the economic value of increased length of stay found that there was a positive contribution. Fewer studies have examined the economic value of intensity of care (e.g., staff to client ratio, hours of counseling per client), but to little effect. These conclusions are, however, specific to particular populations and treatment approaches and should not be broadly generalized to all types of care.

This literature review also discusses findings from cost effective and cost benefit studies that have been conducted on selected groups of high visibility populations. There have been

several economic studies that address well defined populations, although there are gaps in the literature for many populations. Opiate substitution therapy has been the focus of many well-designed economic studies. To date, few cost/economic analyses have been completed on treatment for high profile populations such as adolescents, the elderly, women, and cocaine addicts. The criminal justice system and populations with co-occurring illness (mental health and substance abuse) are also areas where studies have been conducted.

4. SUMMARY AND IMPLICATIONS FOR THE FIELD

There is growing evidence that substance abuse treatment is cost effective, that the economic benefits outweigh the costs of treatment, and increasingly strong information about how to use limited substance abuse treatment funds to maximize returns to the nation. There are a number of audiences that may make use of this literature review.

The primary message for policymakers is that there is increasingly strong evidence that substance abuse treatment probably does pay for itself. Studies have demonstrated that client populations have improved outcomes with respect to use of alcohol and drugs, criminal behavior and social functioning, and often have improvements in utilization of health care services and reductions in health costs. The studies that have been conducted are based on strong scientific methods and use rigorous study designs, although not the most rigorous.

The most important point for substance abuse treatment providers is that the way that they currently deliver substance abuse treatment is likely to continue to change in the future as treatment methodologies are improved. A number of the cost effectiveness and cost benefit studies have identified specific treatment approaches for particular types of clients that are more/less cost effective. While the findings of these studies are not yet broad or strong enough to undertake a redesign of the treatment delivery system, the implications are that this will be possible in the foreseeable future. In addition, the substance abuse treatment field is being moved ahead by the advent of evidence-based practice protocols and treatment guidelines.

There are several issues and trends in the literature that researchers/evaluators can be expected to pay increased attention to in the future when undertaking cost effective and cost benefit studies. These include the use of stronger research/evaluation designs (e.g., using comparison populations) and more standardized methodologies for estimating costs and effectiveness/benefits, such as quality adjusted life years and willingness to pay.

I. INTRODUCTION

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Policymakers and third-party payers are increasingly concerned with accountability for resources spent on substance abuse treatment. There are generally believed to be far more medically indigent persons in need of treatment than public funds available for treatment. The onus is put on managers of treatment systems as well as providers to treat more people with limited dollars and to improve outcomes at the same time. The question that providers, policymakers, and payers constantly face is how to use limited resources in order to yield the greatest client and social benefits. While it is intuitive that any treatment that both improves outcomes and reduces costs should be made available, providers, treatment purchasers and policymakers are more often faced with the decision of whether or not to adopt a more costly and more effective treatment than what is currently being offered. Therefore, it is important for these providers, purchasers, and policymakers to have evidence-based information to help inform decisions of whether or not an increase in effectiveness justifies an increase in cost of a particular treatment.

Cost effectiveness and cost benefit studies can play an important role in evaluating existing and alternative substance abuse treatment approaches and in assessing new treatment methods. Evaluating the outcomes and costs of treatment is necessary in order to determine how to more efficiently allocate scarce resources. While a number of studies have been conducted to date that examine the cost effectiveness and benefits of substance abuse treatment, there are gaps in the literature. This literature review gives a summary of the types of substance abuse treatment that have been analyzed and the outcomes measured, and highlights findings from these studies.

1. PURPOSE OF THE LITERATURE REVIEW

This literature review is intended to provide providers, researchers/evaluators, and policymakers with a compilation of current evidence-based information on the cost effectiveness and cost benefits of substance abuse treatment. Specifically, the goals of this literature review are to:

- # Provide a comprehensive list of the literature available on this topical area
- # Develop an organizational framework with which to examine the literature and identify gaps
- # Identify higher quality and/or more significant studies
- # Identify major conclusions in the literature and areas in need of work.

This document explores the economics of whether substance abuse treatment is effective compared to "no treatment" and assesses the relative effectiveness of different modalities and approaches to substance abuse treatment.

A large number of studies provide data about the economic value of providing treatment relative to not providing treatment. While the studies themselves generally do not make this comparison explicit, this is the most meaningful interpretation of their results. Other studies give economic insights into which approaches to treatment are more or most efficient or cost effective, both in general or for particular types of clients. The findings in this literature review are organized to address the respective questions of whether treatment is cost effective or cost beneficial (relative to an implicit "no treatment" condition) and which types or approaches to treatment are more cost effective or cost beneficial.

Furthermore, different studies have used methodologies that involve different levels of analytical rigor. This literature review also differentiates studies that are more and less rigorous to give the reader a sense of the level of confidence that can be placed in various results. Many studies use a "non-randomized pre-post" study design to analyze outcomes and estimate economic returns. This method, although most frequently employed and easiest to use, is the least rigorous of the methods, and the results are least conclusive. The most rigorous method (including for economic analysis) is the random assignment study where subjects are randomly "placed" into alternative treatment conditions (modality A versus B; approach C versus D; treatment or no treatment). Between these two study design types is a variety of approaches that attempt to identify and use "comparison" populations to judge the relative outcomes of the treatment intervention of interest. While the results of such studies are more convincing than "non-randomized pre-post" studies, they are not equivalent to the "gold standard" of the random assignment study. Accordingly, this literature review attempts to differentiate the level of rigor and therefore, conclusiveness that may be attached to the studies' results.

2. ORGANIZATION OF THE LITERATURE REVIEW

This literature review is organized into an introductory chapter and four additional chapters, plus the Appendices. Chapter II describes the approach used in identifying and selecting relevant literature and data sources on the cost effectiveness and cost benefits of substance abuse treatment. Chapter III presents a summary of the literature through a description of the major trends, areas that are well studied, and areas in which there are gaps in the literature. Chapter IV discusses the implications of the findings for substance abuse treatment policymakers, practitioners, and services researchers/evaluators. To give the reader a general

overview of the nature, objectives and data characteristics of each study identified, Appendix A provides a high-level summary of selected cost effectiveness and cost benefit studies in matrix format. Appendix B gives a brief description of the treatment interventions that are analyzed, the outcome measures used, and the findings of each study.

II. APPROACH

II. APPROACH

This literature review represents an effort to identify, obtain and synthesize the results of the cost benefit and cost effectiveness literature that has been published since 1980. The goal has been to: (1) identify and acquire as much of this literature as possible in a limited period of time; (2) summarize the findings of each of the respective studies; and (3) distill and present the most important conclusions so that practitioners, policymakers and researchers/evaluators can have ready access to this much-needed information. Nearly 60 published works have been identified that are primarily based on analysis of data and attempt to increase our understanding in this area.

To indicate the intended breadth of the effort being reported, we will explain the use of three terms, which are central to this document. These are "cost effectiveness," "cost benefit," and "cost offset."

Cost effectiveness studies are those that analyze the relative efficiency of alternative approaches to improving health. These studies designate or create "indices," which relate defined non-monetary "outcomes" to costs for these alternatives. Generally, only a single outcome measure can be accommodated. In the field of substance abuse treatment, "abstinence" is often the preferred measure, although abstinence can be measured using various time periods (past month versus continuous since treatment discharge) and using different methods (self versus collateral reports, versus biological specimens). When multiple/different outcomes are assessed, it is possible for different measures to tell different stories about effectiveness.

Cost benefit studies differ from cost effectiveness studies only in that outcomes are measured using monetary indices. Cost benefit studies can include multiple and different types of outcomes that can be combined since they are each measured using monetary scales. Some outcomes that are examined in monetary terms in cost benefit studies include crime, victimization, criminal justice expenses, lost work due to illness, and receipt of social welfare benefits. Cost benefit studies that relate the cost of treatment to subsequent savings in health care expenses are called cost offset studies. This literature review treats cost offset studies as a variant of cost benefit studies.

Both cost effectiveness and cost benefit studies require data about the cost of treatment. Cost of treatment includes the expense of delivering substance abuse treatment services by qualified providers as well as the cost of substance abuse treatment services reimbursed by health insurance plans. Cost of treatment estimates are not separately addressed in this document, since such measures are intrinsic to each of the cost effectiveness and cost benefit studies.

This literature review has been performed in conjunction with compilation and development of an annotated bibliography (Malhotra et al., 2002). The objective of this combined effort was to identify published articles, books and government published studies that focus on the costs of substance abuse treatment, the methods for estimating the costs of treatment, and studies of the cost effectiveness and cost benefits of substance abuse treatment. The bibliography provides: (1) a compilation of the studies by summarizing the documents across a set of study characteristics, and (2) an annotated bibliography, including abstracts. The emphasis of the bibliography is on the nature of work done to date, while this literature review focuses on the findings of cost effectiveness and cost benefit studies. The literature review does not highlight reports estimating the costs of substance abuse treatment or the methods for estimating these costs, although these publications are included in the bibliography.

A broad and comprehensive search of the literature was conducted to identify and acquire published articles, books and government-published studies relevant to the goals and objectives of this literature review. The search was initiated with electronic databases. These were augmented with searches of selected government Web sites. Identified abstracts were reviewed for their salience to this topic and appropriate publications and reports were acquired. Finally, the reference lists of the acquired publications and reports were searched to identify further literature that was not found through the electronic or Web searches.

The inclusion criteria were to include all published literature and reports that focused on the cost effectiveness and cost benefits of substance abuse treatment. For this literature review, substance abuse included alcohol and illicit drugs but did not include tobacco. Abstracts focusing on substance abuse prevention, drug testing and law enforcement were excluded since they were outside the scope of this review. Publications were included in this review if they reported on studies that were research based and/or presented cost data. Thus, letters to editors, commentaries and advocacy pieces, which were not primarily research based and did not contain cost data, were not included.

The initial electronic search encompassed nine extensive databases including Medline, PsycINFO, Mental Health Abstracts, EMBASE, Sociological Abstracts, TGG Health and Wellness Database, Applied Social Sciences Index and Abstracts, SciSearch, and Social SciSearch. The search was extensive but did not include all the possible electronic databases that could include literature on economics and health. For example, EconLit, which is a narrow, specialized electronic database used by economists, was not included in this initial search. However, the databases that were searched also cover economics journals, and the subsequent manual search of article reference lists was intended to find further articles relevant to the focus of this literature review. The key words used in the search combined terms for substance abuse

(substance abuse or dependence, alcohol abuse or dependence, drug abuse or dependence, substance related disorders, alcohol related disorder(s), addiction, or alcoholism) with terms related to costs (cost(s), economic(s), cost benefit, cost effectiveness, or cost effective) and treatment. To be included in this review, the search terms had to appear in either the title, the abstract, or the descriptor field of the abstract. The search was limited to English language articles and books published since 1980 that dealt with substance abuse treatment services provided in the United States. The search results produced approximately 1,200 unduplicated abstracts. The substantial and growing general methodological literature about cost effectiveness and cost benefit analysis were not included in this review. The scope and nature of the general methodological literature were beyond our objectives or resources to assess and characterize.

Each abstract was reviewed by two different reviewers to identify studies that were within the scope and objectives of this review. Of the 1,200 abstracts reviewed, 356 met the inclusion criteria and were deemed potentially relevant. We found that a large number of publications made reference to "cost(s)" in their abstracts, but when we reviewed the publication, costs were not a primary or secondary focus of the publication, and therefore the documents were not included in the literature review. We then obtained copies of the relevant articles and books. We checked these citations against a previous bibliography (Caliber Associates, 1999) also on this general topic. Virtually all of the nearly 100 studies in the prior bibliography had been picked up through the electronic search and another 250 high potential citations were found through the broad electronic search after screening.

Finally, we conducted a search of Web sites hosted by the Center for Substance Abuse Treatment, the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and the National Institute on Drug Abuse (NIDA), to identify additional government publications and reports relevant to the topic of this literature review. We reviewed all of the articles, books and research studies and found that of the 356 documents, 53 met the inclusion criteria for their relevance to cost benefits of treatment in regard to specific components of treatment and to specific client populations. A final attempt to identify relevant literature was a search of the literature cited in the final list of studies. This step identified an additional five publications that were relevant to this review. The final number of documents included in this literature review was 58.

In order to characterize this literature (topics with more and less work performed to date), we abstracted information from each study across a number of indicators. The type of information that was abstracted from each document included:

- Type of cost/economic study
- Levels/modalities of care analyzed
- Types of treatment cost measures developed and used

- Type of substance problem studied
- Sociodemographic characteristics of the treated population
- Sources of the cost data
- Types of outcomes/benefits studied.

Users of this literature review are referred to the original publications for additional information on these study characteristics and any other information not discussed in this review. While we discuss the findings of the studies in relation to the level of rigor of the study (e.g., study design), it was beyond the scope of this review to report in great detail about the characteristics of each study. For example, we did not collect information on response rates and/or follow-up rates for each of the studies included in this review, as this information is often not addressed in reports of costs and economics. Readers are referred to the original publications for this information.

For the articles and books we were unable to acquire due to limited time and resources, we characterized the studies based on the information in the electronic abstracts. Two different reviewers reviewed each publication and abstracted the study information. A third reviewer then checked all the articles and corresponding data abstraction to ensure that there was inter-rater consistency among the different reviewers.

The information abstracted for each cost effectiveness and cost benefit study is summarized in a matrix in Appendix A. The matrix enables the interested reader to identify studies of a general type (cost effectiveness) or with a particular focus (alcoholism treatment). This should be particularly useful because even though the literature search and abstraction process identified a narrow and specific literature (cost/economic analysis of substance abuse treatment), there is a high level of variation in the types of studies as well as the focus of the analyses. It is the narrowly defined segments of the literature that can be of particular interest for specific providers, policymakers, and researchers/evaluators.

While we highlight some publications that are good examples of higher quality studies, it was beyond the scope of this document to rate the quality of each study. Nearly all of the publications included in this literature review were publications in peer-reviewed journals, which are considered to be more rigorous studies and of higher quality than publications in non-peer-reviewed journals. However, since the goal of this review was to be as comprehensive as possible, we also included books, dissertations and reports published on government Web sites that were relevant to the focus of this review.

III. FINDINGS

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The findings are organized to provide answers to three types of evaluation questions that can be addressed from an economic perspective as well as from a general perspective. These are:

- # Is some/any treatment better than no treatment?
- # Are some types of treatment more economical than others?
- # Are some approaches or components of treatment better than others?

The three "evaluation questions" are fairly sweeping in their nature, but serve to structure the findings in a manner intended to make the results more accessible to the reader with particular interests. Following these sections, we identify and introduce the cost effectiveness findings for several distinct treatment populations such as females, veterans and opiate addicts.

In the process of surveying the literature, a number of other literature reviews were identified. These other documents may be of interest to readers of this document in order to learn different perspectives on the development and state of the literature. Several of the broader and most up-to-date reviews include Cartwright (1998), French (2001), Holder (1998) and Merrill (1999). This review covers much of the same material of these recent reviews, but attempts to modestly differentiate itself by focusing on major conclusions (the three "evaluation questions"), as well as describing the level of conclusiveness of the findings on different questions and different types of studies. Less attention is given to methodological issues than in some of the other reviews.

Recognizing that each study contains useful information, they have all been abstracted and profiled as to the objectives and characteristics of the study; populations and types of treatment that were studied; the nature and amount of data; and a statement of the main findings about the cost effectiveness or cost benefits of substance abuse treatment. The exhibit in Appendix A summarizes the types of treatment and populations studied for each of the studies included in this literature review. Appendix B provides a succinct description of each of the studies' findings and study design.

1. IS SOME/ANY TREATMENT BETTER THAN NO TREATMENT?

This very blunt, challenging question is the primary question that some policymakers would like to have answered whenever funding issues arise. There is a vocal minority of policymakers who believe that the available evidence demonstrating that substance abuse treatment "works" is not "conclusive" but is only strongly indicative. More than 30 years after the creation of national treatment systems for alcohol and drug disorders, there is underlying

scepticism as to whether substance abuse treatment works at all, or at least well enough to be worth paying for with public appropriations or with health insurance premiums.

1.1 Benefits Defined Broadly

Recent cost benefit studies looking at a broad scope of client behavior changes and associated economic impacts (e.g., improvements in crime, health, and social functioning) have estimated that benefits are consistently greater than and often are many times larger than the costs of substance (alcohol or drug) abuse treatment. Cost benefit studies use monetary factors to convert multiple types of outcomes (e.g., crimes, victimization, criminal justice expenses, lost work due to illness, receipt of social welfare benefits) into values that can be compared to the cost of treatment. In contrast, cost effectiveness studies focus on a single outcome (most usually abstinence from drug/alcohol use) in order to compare the respective effectiveness and costs of alternative treatments. Cost benefit results are discussed below, followed by cost effectiveness studies.

In a recent study, French et al. (2000) estimated that two different approaches to treatment paid back about $10 and $23, respectively, for every dollar spent on treatment in two different Washington State clinics. Gerstein, Harwood, and Suter (1994) estimated an average economic return of about $7 for a dollar spent in the California treatment system, a finding which was replicated by Finigan (1995) for the Oregon treatment system. While French and Gerstein used self report data, Finigan had access to State of Oregon administrative data about arrests, incarceration, child welfare, and benefits received from social welfare and Medicaid. Somewhat smaller–but still quite positive--estimates of about $4 to $1 were found by Koenig, Harwood, Sullivan, and Sen (2000b) in a representative sample of Federally-funded substance abuse treatment programs.

It is important to note that the cost savings estimated in cost benefit studies are not direct savings to the government (or other individuals). While there generally are some monetary savings to government included in the total, these study estimates are calculated by applying a monetary value to the outcomes or benefits of the treatment. These studies try to demonstrate whether or not treatment reduces the total social costs of substance abuse (to government, to other individuals, to businesses, insurance companies, etc.) by an amount that exceeds the cost of treatment. When examining the results of cost benefit studies, the “perspective” of the study is an important consideration. Depending on the study objectives, cost benefit studies can be estimated for government (Federal, state or all levels), individual treatment providers, third-party

payers (e.g., insurance company) or society as a whole. Each study should identify the "perspective" of the benefits and the costs.

Most of the benefits in these studies are from reductions in crime and improvements in employment/productivity. This is because these outcomes may be easier to translate into monetary terms, compared to other outcomes, such as improved social functioning or family relations, which may be more difficult to monetize, but are benefits to society. It is necessary to consider what outcomes are being examined/monetized when cost benefit studies are compared, as the study of different outcomes limits the ability to make comparisons, such as those related to crime victims, health status and productivity. The interested reader is referred to the articles themselves, as this level of detail is beyond the scope of this review. Appendix B provides succinct summaries (in alphabetical order) of the characteristics and primary results and conclusions of these and all of the other cost effectiveness and cost benefit studies that are discussed.

It is noteworthy that the studies only count benefits during the first year after treatment. Although some clients do relapse and return to treatment, many clients stay in recovery for several years if not the rest of their lives. For these clients, the benefits multiply across the rest of their lives. Because many clients relapse at least once, in order to avoid overestimating benefits, most studies only estimate benefits for the time period with direct data about behavior and outcomes of clients. Paradoxically, this could have the effect of seriously underestimating economic benefits from treatment, even after adjusting for clients who require multiple treatments.

1.2 Benefits Only Including Health Care Expenditures

A greater number of studies have analyzed the economic benefits of substance abuse treatment in terms of reduced health care utilization and costs ("cost offsets"). Thus, the estimates of benefits are much smaller than studies which include crime-related and productivity benefits. These studies of populations covered by health insurance (mainly private, although a few use Medicaid or Medicare populations) consistently find that health costs and utilization rise dramatically prior to initiation of alcohol (or drug) treatment and fall dramatically following the period of treatment (Goodman, Tilford, Hankin, Holder, & Nishiura, 2000; Holder & Close, 1986; Holder & Hallan, 1986). The objective of such studies has been to examine whether it is economically advantageous for health insurance to cover treatment for alcohol and drug problems. The idea of "cost offsets" is that covering substance abuse treatment will pay for itself by reducing health care utilization and costs for problems caused by substance abuse.

In a study with 14 years of insurance data, Holder and Close (1992) found that following treatment for alcoholism, health care costs "declined by 23 percent to 55 percent from their highest pretreatment levels." Another study employing several estimation methods found in their "middle-of-the-road" estimate that these offsets made up for the cost of the alcoholism treatment within 2 years after treatment ended (Holder & Schachtman,1987). These results are typical of this segment of the literature.

Several studies of insured populations have compared health costs of those treated for alcohol and drug abuse with non-abusing populations. Not surprisingly, those getting treatment have total health costs several times higher than the non-abusing population before treatment initiation. Still, Holder and Hallan (1986) tracked the two populations for up to 4 years and found that health costs were nearly identical at the end of that period. In a recent study of a similar nature Goodman et al. (2000) also found a reduction (but not a closing) of the gap in costs between comparable treated and non-abusing populations over time. This study undertook further analyses and concluded that there are cost offsets for treatment of "alcohol abuse" but probably not for treatment of alcohol dependence or for individuals with mental comorbidities.

Another type of study with insured individuals has compared total health costs of treated substance abusers with diagnosed but untreated individuals. In an HMO analysis that looked at patients complying with and refusing referral to outpatient alcoholism treatment, Reiff, Griffiths, Forsythe, and Sherman (1981) estimated that the treated population had about $500 per year lower post-referral insured health costs. In most of these studies, substance abusers are usually identified via health insurance claims for treatment of another health problem, where the clinician includes a substance-related diagnosis even though they are not treating the disorder. For a privately insured population, Holder and Close (1992) estimated that after treatment initiation the treated alcohol abusers had 24 percent lower health costs than comparable untreated alcohol abusers. This differential lasted out to 3 years. In an Ohio Medicaid population, treated substance abusers had annual insured health costs of about $500 less than diagnosed but untreated individuals (Gerson et al., 2001). This methodology is stronger than the single population pre-post studies discussed above, and therefore is more convincing, but is still not conclusive.

1.3 Limitations of Pre-Post Cost Benefit Studies

The cost benefit studies discussed immediately above all compare client behaviors and costs in the during- and post-treatment period to the pre-treatment period. They consistently find pro-social changes in behavior, health, and economic benefits. Economic valuation suggests that

treatment is cost beneficial. Still, there have been relatively few cost benefit studies of this nature performed primarily due to weakness in this analytic design which undercuts the conclusiveness of the generally very strong results.

The methodological challenges to these two types of study (using the pre-post comparison of a single population, or comparing treated and identified and untreated individuals) are clear and not easily addressed. In non-technical language, the problem with pre-post comparisons is the risk that people go into treatment at exactly the time that they are having the most problems. This situation is believed to motivate change, and substance abusers seek assistance (if it is available) through treatment. It is possible that even if untreated, substance abusers might change their behaviors for the better. Some of the pre-post behavior change could have happened anyway. Using pre-post changes therefore, could overestimate the positive contribution of treatment to behavior change and social benefits. Accordingly, these cost benefit studies can not be considered "conclusive." The economic and non-economic findings are always strong, but they are subject to questioning because of the lack of a comparison or control group.

This weakness in the level of conclusiveness is not intrinsic to substance abuse treatment specific economic analysis. It reflects the fundamental limitation in the substance abuse treatment research/evaluation field because placebo controlled random assignment studies are not undertaken. Still, a recent report by a National Academy of Sciences Committee (National Research Council, 2001) urged greater efforts to develop and undertake placebo-controlled random assignment substance abuse studies because other study designs (such as those used in the studies above) cannot give conclusive results. However, up to this time placebo controls are not used in the substance abuse field because of the real ethical concerns of withholding treatment from individuals who seek care. It is unclear whether or how such studies can be done.

2. ARE SOME TYPES OF TREATMENT MORE ECONOMICAL THAN OTHERS?

The question of what kind of substance abuse treatment to recommend for clients is at issue for many managers of treatment organizations and purchasers of services. There can be dramatic differences in cost between ambulatory, residential and hospital-based levels of care. This question has received a significant level of attention in the clinical literature and economic analyses have followed suit. Analysts usually undertake cost effectiveness analysis when this is the question. Recall that in cost effectiveness, a single effectiveness measure is assessed (usually abstinence) while the treatment expenses (and often health and other monetary expenses) are summed together.

Before the main findings are reviewed, it is important that the reader be aware of important caveats to these conclusions. First, this report identifies studies that may be of interest to policymakers, practitioners, and researchers/evaluators by presenting the main results derived from relevant studies that have been conducted. This review has not assessed or validated either the results or the methodology respective studies have employed. Probably more important, each study has a unique combination of factors that are central to any conclusion about cost effectiveness or cost benefits, including the level of care (e.g., inpatient, residential, ambulatory); approach to therapy (e.g., therapeutic community, motivational enhancement therapy, 12 step, relapse prevention, etc.); the fidelity of implementation of the therapy; the characteristics of clients (e.g., age, gender, mental illness, criminal history, etc.); and their severity (including alcohol/drug type/combination, dependence/abuse, duration of problem). In a particular study, one approach to treatment may be more cost effective than another; however, that result is conditional on the above characteristics.

In other words, what does/does not work for one group (or even several groups) of clients may not apply to a different group. It would be inappropriate to generalize cost effectiveness of two alternative treatments for marijuana-abusing teenage, pregnant females based on results for adult male alcoholics. It may appear that some trends in cost effectiveness are developing from the rapidly improving and expanding literature. Still, there is a great deal to be done to test the cost effectiveness and cost benefits of different treatment approaches for different types of clients.

As discussed above, economic analyses of substance abuse treatment can be more or less rigorous and convincing, depending on the methodology used. While many studies use methods that are less rigorous, it has been possible for investigators to use the most rigorous methods (random assignment) to analyze the comparative effectiveness of different treatment approaches. This discussion will primarily focus on the results of the more rigorous studies.

The economic literature has produced a handful of studies that conclude less expensive treatment modalities or level of care are more cost effective or cost beneficial than more expensive approaches. These studies compare the outcomes of clients getting alternative levels of care and find that their outcomes/results are very similar (at least not significantly different); however, the costs of the two are quite divergent, giving the preference to the low cost–generally less intensive approach. This was exactly the case for a comparison of outpatient detoxification for alcoholism versus inpatient detoxification (Hayashida et al., 1989). This was the only cost effectiveness study identified that used random assignment on this very expensive element of the national treatment system.

A set of four studies (with six published economic analyses) has compared the cost effectiveness of hospital inpatient treatment to intensive outpatient (IOP) treatment lasting 2 to 4 weeks (Alterman et al., 1994; Bachman et al., 1992; Longabaugh et al., 1983; Schneider, Mittelmeier, & Gadish, 1996). These random assignment studies each found no significant difference in outcomes between the two approaches. The studies were done with several different types of client populations: male adults and both male and female adults; cocaine addicts; polysubstance abusers; and alcohol abusers. Each of the projects compared costs (actually the standard provider charges) and reported that day treatment costs about half (or less) as much as inpatient care lasting about the same duration.

Two other very rigorous studies compared day treatment and intensive outpatient (IOP) to less intensive treatment regimens. An HMO used random assignment to compare the cost effectiveness of a "step-down day treatment to IOP" versus "IOP alone" for a polysubstance population, both protocols lasting 8 weeks (Weisner et al., 2000). Similar to the other studies, there were no differences between the two treatment groups at follow-up. The step-down program cost almost twice as much as the IOP (about $1650 versus $900). Avants et al. (1999) found for a medically indigent methadone population that day treatment was no more effective than "enhanced standard" care, and again the more intensive treatment cost about twice the less intensive care.

3. ARE SOME APPROACHES OR COMPONENTS OF TREATMENT BETTER THAN OTHERS?

Economic analysis has been applied in a number of studies to discover whether particular enhancements or approaches are more cost effective or cost beneficial. Since more than 80 percent of clients get ambulatory treatment, it is logical that most of the analysis concerns improvements to this type of care. A modest number of different enhancements or approaches (at least modest relative to the number of approaches catalogued in encyclopedic studies by Holder, Longabaugh, Miller, and Rubinis (1991) and Finney and Monahan (1996)) have been studied with varying levels of rigor. Length of stay in treatment has been analyzed more often than any other specific improvement. A few studies have looked at the cost benefits of intensity of care, while a range of components has been modified or added to treatment.

Each of the studies that analyzed the economic value of increased length of stay found that there was a positive contribution. Harwood, Hubbard, Collins, and Rachal (1988) estimated that an additional day of treatment retention reduced crime-related costs during and in the year following treatment by two to four times the cost of the day of care. French, Zarkin, Hubbard,

and Rachal (1991) and French and Zarkin (1992) found that increased stay in treatment resulted in significant increases in earnings as well as decreases in illegal earnings, although by much less than the cost of the care. More recently, Koenig et al. (2000b) estimated that post-treatment benefits only partially offset the costs of the additional day of treatment. An analysis of the Veterans Affairs inpatient alcohol treatment system (Barnett & Swindle, 1997) found that 28-day programs had modestly better outcomes than 21-day programs (78% success versus 75%); however, the improvement was judged too small to warrant operating 28-day programs given the costs are materially higher.

The economic payoff from intensity of care has also been studied, however, to little effect. Barnett and Swindle (1997) as well as Machado (2001) and Koenig, Harwood, Sullivan, and Sen (2000a) found no evidence that staff-to-client ratio, expenditures per client, or hours of counseling per client-month were related to outcomes (respectively), suggesting that cost minimization is cost effective. However, none of the studies were able to estimate the most cost effective level of staffing and resources.

The above studies have been similar to the work that has assessed whether "some/any treatment is better than no treatment" in that the comparison populations and conditions have not been randomly assigned. In fact, unlike the first work discussed, any of the topics cited immediately above are amenable to random assignment. Analysts performing economic analyses have not had access to such studies, however. It is hoped that studies will be designed and undertaken in the near future that attempt to identify more effective and cost effective characteristics of treatment, including "intended length of stay" and staffing/resource intensity per client.

Still, there have been a number of quite strong and interesting cost effectiveness studies about alternative approaches to treatment. Random assignment with cost effectiveness has been applied to a variety of treatment topics with good success. Adding marital therapy to standard outpatient treatment has been studied by Fals-Stewart, O'Farrell, and Birchler (1997); O'Farrell, Choquette, Cutter, Floyd et al.(1996); and O'Farrell, Choquette, Cutter, Brown et al. (1996). The first of these studies concluded that for married or cohabitating alcohol abusers combining behavioral couples therapy with individual counseling was more effective than individual-based treatment alone, and no more costly. O'Farrell, Choquette, Cutter, Floyd et al. (1996) tested two different approaches to working on marital/couples issues and concluded that "behavioral marital therapy" yielded significantly better outcomes than "interactional couples" therapy and was also less expensive. O'Farrell, Choquette, Cutter, Brown et al. (1996) then tested to see whether adding relapse prevention after behavioral marital therapy was cost effective and found that the

relapse prevention marginally improved outcomes, however, at a significant increase in cost; thus, this enhancement was judged not cost effective.

4. ECONOMIC ANALYSIS OF DISTINCT CLIENT POPULATIONS

The substance abuse field is quite diverse in both the types of substances abused, approaches taken to treatment, and segments of the client population. In the following section, the objective is to succinctly address the nature and conclusions of cost effectiveness and cost benefit research that has been done on selected groups of high visibility. In actuality, there have been only a few economic studies that address well defined populations. The interested reader is reminded that the distinct client/substance use foci of each of the studies have been coded and can be identified in the exhibit in Appendix A.

4.1 Females

There has been very limited economic analysis of treatment for females. Still, these studies tend to show results as favorable as the general population and the much more numerous male-only studies.

Harwood, Fountain, Carothers, Gerstein, and Johnson (1998) analyzed costs and benefits of treatment for females and males separately from the California outcome study (Gerstein et al., 1994). Females were less likely to get intensive residential care than males, although they stayed similar lengths of time. Benefits for treatment of females to the non-drug using population were about four times greater than the cost of treatment, somewhat lower than the ratio for males. It was found that female substance abusers, on average, had significantly lower levels of criminal involvement (and therefore costs); thus, there was less opportunity for improvement and to yield benefits.

In an attempt to estimate the economic value treatment for substance abusing pregnant women, Svikis et al. (1997) studied samples of successfully treated versus untreated women. Newborns of treated women were heavier, of greater gestational age, less likely to require neonatal intensive care unit (NICU) admission and had shorter NICU stays if admitted. Treated women had costs of $6,600 (for day treatment), and average NICU costs per birth were $900 for treated women versus $12,200 for untreated women. The results of this analysis were probably affected by the focus on treatment completers and the boarder baby situation (lack of care options for newborns of actively substance abusing women).

Daley et al. (2000, 2001) analyzed the economic returns from improved birth outcomes and changes in criminal activity associated with the treatment of 440 Medicaid-eligible pregnant women in five modalities of care. They concluded that even detoxification (the least intensive care delivered) was cost beneficial, and post-detoxification benefits in terms of crime reduction were well in excess of treatment costs. Residential and combined residential-outpatient treatment were the most cost effective modalities, judged to be clearly better than standard outpatient, methadone and detoxification. The analysis of birth outcomes again found that detoxification alone yielded the poorest birth outcomes in terms of birth weight and gestational age. In general, the more intensive (costly) the treatment intervention the better the birth outcome. However, outpatient treatment yielded the greatest increase in birth weight per dollar spent on treatment.

One of the current policy questions is whether substance abusing offenders (females or males) should be incarcerated or diverted/mandated into community-based treatment. Berkowitz, Brindis, Clayson, and Peterson (1996) analyzed the respective costs of these two options for pregnant and parenting female offenders. The study concluded that mandating women into treatment saved about $3,000 compared to the nearly $17,000 in expense to incarcerate (and treat them in prison) for six months. They further found that females mandated to treatment (in contrast to self-referred) stayed in treatment longer and were more likely to successfully complete.

4.2 Adolescents

Adolescents are an increasingly visible population in the treatment mix. In the most recent national data, almost 10 percent of admissions are youth under 18 years of age. Still, there has been comparatively little work performed on effectiveness or economics. The single cost effectiveness/benefit study identified was Schoenwald, Ward, Hennggeler, Pickrel, and Patel (1996), who compared the costs and effectiveness of intensive "multisystemic therapy" (MST) with "usual services" for adolescents at home but at risk of out-of-home placement. It was found that MST (an intensive mix of substance abuse, mental health and social services) reduced adjudicated arrests by 26 percent and time incarcerated by 46 percent. Costs for therapeutic (substance abuse and mental health; ambulatory plus residential) services increased by 50 percent over usual services. The substantial reduction in incarceration from MST, however, offset much of the increase in therapy costs.

4.3 Veterans

Populations of veterans have been the focus of a half dozen economic studies. The consistent theme of these studies has been to identify cost effective approaches to treatment. These studies are strong methodologically, making their conclusions compelling.

The Department of Veterans Affairs (VA) has traditionally provided intensive, hospital inpatient care for veterans with severe alcohol and polysubstance problems. Since this approach to treatment is quite expensive, VA-affiliated clinicians and researchers have undertaken a strong research program to identify more effective and cost effective approaches with some success.

Schinka, Francis, Hughes, LaLone, and Flynn (1998) used a randomized design to compare costs and short-term outcomes of inpatient treatment versus supportive housing plus day treatment, concluding that outcomes were identical, while inpatient treatment cost twice as much. Random assignment of male cocaine abusers to about 1 month of inpatient or day treatment was studied by Alterman et al. (1994). Outcomes at 7 months were virtually identical, while costs per client were about 64 percent less in day treatment. One study examined the cost effectiveness of treatment for "older veterans." Kashner, Rodell, Ogden, Guggenheim, and Karson (1992) randomly assigned older (45 years and above) alcoholic veterans into two treatment tracks, each comprised of 3 to 4 weeks of inpatient care followed by up to a year of outpatient treatment. One track (only for older alcoholics) was more supportive, focused on peer relationships and self-esteem, while the other (a general track) was more oriented to problem identification and solution and was more confrontational. Clients in the specialized track were twice as likely to be abstinent at the one-year follow-up. Total health costs were actually slightly lower for the specialized track (including alcohol treatment, nonalcoholism care, care in and out of the VA system).

An analysis of the VA inpatient alcohol treatment system (Barnett & Swindle, 1997) found that 28-day programs had modestly higher outcomes than 21-day programs; however, the improvement was judged too small to warrant operating 28-day programs given the higher costs. The cost effectiveness of two alternative approaches to inpatient treatment were tested by Humphreys and Moos (2001). Matched samples of veterans treated in cognitive behavioral programs had 70 percent higher behavioral health costs in the year after treatment than those in 12-step oriented programs. Alfano, Thurstin, and Nerviano (1987) studied a cohort of alcohol dependent male veterans that received up to 35 days of inpatient treatment. They found that after treatment more than 80 percent of the able-bodied were successful at getting and keeping jobs,

and the estimated taxes from their earnings paid for the cost of the treatment for the able-bodied veterans within about 13 months.

4.4 Co-Occurring Mental Illness and Substance Abuse

Mental illness comorbidity is arguably the most prevalent complication for substance abusers. It is one of the priority areas for developing and improving services in SAMHSA. However, few studies have looked at the economic implications of treating this population or the cost effectiveness of alternatives.

In one study (Lennox, Scott-Lennox, & Bohlig, 1993), the total health care cost-offsets of depression-complicated alcoholic clients were compared to clients without depression. The depression-complicated clients had higher health care costs before treatment initiation, and following treatment they did not experience total health care cost reductions (unlike those without depression). This study demonstrates the economic impact of mental comorbidities on treatment. The question then turns to what are cost effective strategies for treating these clients.

Two economic studies have been identified that assess cost effective alternatives for treating severely mentally ill substance abusers. In the first study, three alternatives for serving severely mentally ill clients with substance abuse were studied by Jerrell and Hu (1996). The cost reduction ratio for intensive mental health plus societal costs over the 24-month post-treatment period for the 12-step model was $9, compared to $0.53 for the behavioral skills model and $8.89 for the case management model. Across the three interventions, supportive, low intensity mental health plus substance abuse treatment resulted in cost savings of over 40 percent during the post-treatment period, with the 12-step and case management models having the most cost reductions.

In another study (French, Sacks, DeLeon, McKendrick, & Staines, 1999), mentally ill homeless substance abusers were assigned to a modified therapeutic community (TC) or "treatment-as-usual" (i.e., at least not initially to TC or residential substance abuse treatment). At follow-up, the modified TC group experienced significantly lower levels of alcohol intoxication, criminality, and depression than those in the treatment-as-usual group and incurred a lower cost of health treatment with offsetting costs for TC services. Even though total substance abuse plus mental health costs were the same, therapeutic community was a cost effective alternative.

4.5 Prisoners/Offenders

This is another area that appears to be under studied in economics. About half of clients admitted to public treatment programs are involved with the justice system at admission. Further, clients tend to have prior criminal histories. Initiatives such as drug courts and treatment in prisons and jails have gained impetus over the past decade. This review identified three published reports and two dissertations. The 1997 SAMHSA survey (SAMHSA, 2000) of prisons and jails found more than half of prisons and about one third of jails and juvenile facilities offer treatment (of some level).

Hughey and Klemke (1996) analyzed a five week in-jail program (followed by community outpatient for up to a year) for jail inmates with substance abuse problems. Offenders completing the in-jail program (about 85% of those initiating) had significantly lower rates of re-arrest compared to similar inmates who did not receive treatment. Savings after treatment costs only from lower rates of re-incarceration were about $3,500 per offender. There are further (but unestimated) benefits from reduced victim costs, as well as police and court costs.

Berkowitz et al. (1996) analyzed the respective costs of incarcerating or diverting/ mandating pregnant and parenting female offenders into community-based treatment. The study concluded that mandating women into treatment saved about $3,000 compared to the nearly $17,000 in expense to incarcerate (and treat them in prison) for six months. They further found that females mandated to treatment (in contrast to self-referred) stayed in treatment longer and were more likely to successfully complete it. Longer term benefits (after discharge from treatment) and costs were not reported.

Maddox (1996) reviewed the findings from drug courts. Citing various sources it was estimated that cost savings from treatment exceeded $5,000 in incarceration costs compared to treatments costs of $900 to $1,600 per defendant. Recidivism rates and drug use post-treatment were also reduced.

Koenig, Denmead, Nguyen, Harrison and Harwood (1999) used data from the National Treatment Improvement Evaluation Study (NTIES) to estimate cost offsets for correctional treatment. They found that the percent of clients who reported any criminal activity declined by 60 percent after treatment and that the average number of crimes per year dropped by 74 percent post-treatment. The average annual crime-related costs to society fell by $8,611 per client. This decrease corresponds to a 75 percent reduction in crime-related costs relative to the equivalent costs in the pre-treatment period. The benefits to the non-related costs population followed a

similar pattern to the costs to society. On a per client basis, the benefits to non-treated individuals were $12,265 or 75 percent of pre-treatment costs.

4.6 Opiate Substitution Therapy

Some of the best and most conclusive economic analyses have been done on opiate substitution therapy. Kraft, Rothbard, Hadley, McLellan, and Asch (1997) did a random assignment study of the cost effectiveness of low, medium and high levels of counseling and support services for methadone clients, finding that the medium, level was most cost effective, even though the high level yielded modestly better results.

Several recent studies have undertaken more advanced cost effectiveness analyses through the construction of simulation models. Barnett (1999), Barnett and Hui (2000), and Zaric, Barnett, and Brandeau (2000) have developed models that attempt to facilitate comparison of the results from substance abuse treatment with other health interventions using the general health model published by Gold, Russell, Siegel, and Weinstein (1996). The Gold model has gained wide use as a method to compare the cost effectiveness of prevention and treatment strategies that address diverse health problems. While there are quite significant analytic challenges to using the Gold framework for substance abuse, these papers make major strides in this direction.

Barnett (1999) used a Swedish placebo control random assignment study to estimate cost effectiveness of methadone maintenance. They estimated that one additional life year is saved for each $5,900 spent on methadone treatment. This compares very favorably with results for other health interventions. In general health, an intervention costing up to $50,000 per life year is considered cost effective; this analysis indicates methadone treatment is very cost effective. This model was significantly extended by Zaric et al. (2000) to specifically assess the economic benefits of using methadone to reduce HIV transmission. In a community with high HIV, prevalence, expanded methadone capacity yields an additional 1 year of quality-adjusted life at a cost of $8,200. The study underscored that most of the benefits are with the non-injection drug using population.

Barnett, Zaric, and Brandeau (2001) analyzed the cost effectiveness of buprenorphine for opiate addiction in order to ascertain how the price for the medication will affect economic conclusions. Building their results on random assignment studies, they estimated that buprenorphine is cost effective (costs less than $45,000 per quality adjusted life year saved) at a price of up to $30 per dose if applied to clients who would not use methadone. However, buprenorphine is less effective as well as more costly than methadone, making methadone the treatment of choice for clients that will accept methadone maintenance.

IV. SUMMARY AND IMPLICATIONS FOR THE FIELD

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There is growing evidence that substance abuse treatment is cost effective (that the economic benefits outweigh the costs of treatment) and increasingly strong information about how to use limited substance abuse treatment funds to maximize returns to the nation. This is a highly diverse literature that has been continually evolving since the 1980s. Major advances have been made in recent years in terms of economic theory, data, and estimation methodology. The greatest proportion of the literature that has been identified has been produced since 1995; thus, there are current findings and data on many topics and issues. Altogether this effort has identified and acquired about 60 studies (published in the peer-review literature, by CSAT, NIDA or NIAAA or posted on the Web sites of these agencies) about the cost effectiveness and cost benefits of substance abuse treatment.

In this literature review, the intent has been to first, broadly characterize and summarize the major studies conducted and secondly, succinctly summarize the conclusions offered by the particular studies that have been undertaken. This summary attempts to frame the conclusions in relation to analytic issues and to give a sense of the general level of conclusiveness of the findings based on the rigor of the data and analyses.

There are a number of audiences that may make use of this review. The following discussion presents findings and conclusions from the literature that may more clearly speak to the primary interests of particular audiences, including policymakers, practitioners, and researchers/evaluators.

1. IMPLICATIONS FOR POLICYMAKERS

The primary message for policymakers is that there is increasingly strong evidence that substance abuse treatment does pay for itself. Studies have demonstrated that treated client populations have improved outcomes with respect to use of alcohol and drugs, criminal behavior, and social functioning and often have improvements in utilization of health care services and reductions in health costs.

A particularly important and successful development in the field is the rapidly increasing effort to identify cost effective approaches to treatment. Researchers and evaluators are slowly but surely identifying treatment approaches that are better or less expensive or yield improved results at modest increases in cost. This knowledge is allowing both the public sector and the private sector treatment systems to improve their efficiency in delivering effective treatment.

Better results can be generated with the original funding, and new funding can be directed to the most efficient strategies for reducing the human and economic burden of substance abuse.

It is important that policymakers know that this research on the cost effectiveness of substance abuse treatment is increasingly of the very highest quality science. Rigorous designs and standards are being applied. The best substance abuse research is equivalent in all respects to the best medical research being undertaken under the sponsorship of private medical and pharmaceutical companies or the National Institutes of Health. One of the long standing concerns in the minds of some policymakers was that too little of the evidence for the effectiveness–and the cost effectiveness–of substance abuse treatment was based on strong scientific methods. This has improved rapidly over the past decade as the field has grown, treatment approaches have become better understood and defined, and support has increased in the treatment community for exploring new approaches to care.

2. IMPLICATIONS FOR PRACTITIONERS

In many respects the most important point for substance abuse treatment providers is that the way they currently deliver substance abuse treatment is likely to continue to change in the future. Several cost effectiveness and cost benefit studies have succeeded in identifying specific treatment approaches for particular types of clients that are cost effective. The number of such studies being done has been accelerating over the past 10 years. While the early results are not yet broad or strong enough to immediately undertake a wholesale redesign of the treatment delivery system, the implications are that this will be possible in the foreseeable future.

The substance abuse treatment field, like general health, is being moved ahead by the advent of evidence-based practice protocols and treatment guidelines. This challenge is being picked up by the Center for Substance Abuse Treatment in their Technical Assistance Publications (TAPs) and Treatment Improvement Protocols (TIPS), as well as by the National Institute on Drug Abuse (1999) as they develop and publish documents on increasingly well-defined and effective approaches to treatment. The substance abuse treatment field is following the example of general medicine in the specification of well-defined treatment protocols that correspond to particular diagnostic criteria. The cost effectiveness literature is fundamental to the ability of the field to identify and disseminate particular treatment approaches as generally recommended guidelines.

A specific example of this process stands out in the cost effectiveness literature that has been identified. A challenging set of rigorous studies (Alterman et al., 1994, Bachman et al.;

1992; Longabaugh et al., 1983; Schneider et al., 1996) has tested the cost effectiveness of high cost (hospital inpatient care) with lower cost but still "intensive" day treatment delivering essentially the same therapeutic content. These studies consistently found that outcomes were similar for the two settings, while costs were much lower for day treatment. This set of findings was most relevant for private insurance plans and the VA system (and for those individuals and families who can afford to pay for treatment themselves); however, it demonstrates the principle that rigorous research can be designed and implemented to yield results with clear practical implications.

3. IMPLICATIONS FOR RESEARCHERS/EVALUATORS

The research/evaluation field has clearly realized that cost effectiveness studies are important to perform. As indicated before, most of this substance abuse cost effectiveness literature has been published since 1995. There is a growing demand for work of this nature. The demand is coming from several directions at the same time. Treatment system managers are looking for strong, pragmatic analysis to assist them in managing their limited resources. They have given researchers/evaluators entree to their systems and to their data. Clinical researchers have realized that economic and cost data are highly complementary to their primary effectiveness research. The data necessary for cost effectiveness analysis are neither very difficult/expensive to obtain nor do they interfere with research design or data collection strategy. Finally, funders of substance abuse treatment evaluation and research (e.g., the Center for Substance Abuse Treatment, the National Institute on Alcohol Abuse and Alcoholism and National Institute on Drug Abuse) are quite interested in supporting cost effectiveness studies as adjuncts to outcomes and effectiveness studies.

There are several issues and trends in the literature that analysts can be expected to pay increased attention to in the future. These include stronger research/evaluation designs and the use of more standardized methodologies for estimating costs and effectiveness/benefits.

It will be important, as well as increasingly possible, to undertake studies with comparison populations. A growing number of studies have been done with either strong quasi-experimental comparison populations, natural assignment (not under control of the clinician, client or researcher/evaluator) or random assignment. While single-population pre-post studies have been the most used method for many years, such studies have never been considered conclusive even though or perhaps because cost benefit and cost effectiveness results were quite robust. While it is unlikely that substance abusers can ever be randomized to placebo control ("no treatment") conditions, the science of treatment (as well as research/evaluation design) has

advanced sufficiently that there are numerous cost effectiveness issues to address that do not require such a design. Policymakers and practitioners need to know which alternative approaches for which client populations are more cost effective. A number of projects identified in this literature review (and further rigorous treatment research studies that have not yet assessed economics) demonstrates that this can be done without placebo control designs.

Finally, the literature identified in this review and in the accompanying bibliography (Malhotra et al., 2002) represents major attempts at and actual advances in methodology that will make future studies better and easier to perform. Protocols exist to estimate the cost of treatment (French & McGeary, 1997; Anderson, Bowland, Cartwright, & Bassin, 1998; Capital Consulting Corporation, 1998) if there are no reliable cost data available, and with new approaches it will be necessary to develop new cost estimates.

The general methodology for performing cost effectiveness studies has gotten a major jump-start from the work of a Public Health Service Task Force (Gold et al., 1996) and several other important contributions (Drummond, O'Brien, Stoddart & Torrance, 1997; Hargreaves, 1998).

The strongest challenge for the substance abuse treatment field is to develop cost effectiveness estimates for treatment that can be meaningfully compared with the general health field. The primary issue will be to measure treatment outcomes using measures such as quality adjusted life years (Gold et al., 1996) or disability adjusted life years (Murray & Lopez, 1996). Important first steps have been made by Barnett (1999), Barnett et al. (2001) and Zaric et al. (2000). As they point out, there is not yet a well established method to measure quality adjusted life years of substance abusers in and out of remission.

Moreover, assessing the effectiveness (and cost effectiveness) of substance abuse treatment is complicated by the fact that substance dependence and abuse can be long-term disorders, often involving multiple periods of recovery and remission. Treatment approaches are evolving to address these realities. However, much of the treatment research/evaluation that has been the subject of cost effectiveness analysis has been oriented to acute treatment episodes, with outcomes typically assessed for a year, sometimes longer. Future research/evaluation will need to incorporate these realities in order to yield more meaningful results.

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APPENDIX A
COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

APPENDIX A
COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

Appendix A contains two exhibits. The first exhibit (Exhibit A-1) summarizes the data that were abstracted from the cost effectiveness and cost benefit studies, including:

- Study design/comparison population used
- Level/modality of care examined
- Type of cost estimate studied
- Data source used
- Type of outcome/benefit assessed
- Client population examined.

The coding scheme used to characterize the studies follows Exhibit A-1 (see Exhibit A-2).

EXHIBIT A-1

COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

Study		Level/Modality of Care														Type of Cost Estimate							Data				Type of Outcome/ Benefit			Clients		
First Author (Year)	Study Design/Comparison	Hosp. Inpt. Detox.	Hosp. Inpt. Rehab.	Resid. Detox.	Resid. Rehab	Outpt. Detox.	Intensive Outpt (or "day")	Standard Outpt.	Outpt. Opiate Substitution	Other Medication	Independent Practioner	Specified Adjunct Component	Self Help (e.g., AA, CA, NA)	Continuing Care (incl. Aftercare)	Ins. Reimbursements	Episode - Completed	Episode - Average	Day of Care (24 hrs./ "Slot Cost")	Week/Day Enrolled (Ambulatory)	Encounter/Visit (Ambulatory)	Specified Units of Service	Covered Reimbursements	# of Providers	# of Clients	Year(s) of Data	Source of Cost Data	Success/Improvement	Quality/Disability Adjusted Life Yrs.	Economic Value	Poly or Single Substance	Comorbid SA/MH	Demographic
Alfano (1987)	1		x														x						1	150	NS	1,3			P	A		V
Alterman (1994)	5		x				x							x				x	x				1	111	88-89	1	x			C		V
Avants (1999)	5								x			x				x			x				1	291	1995	2	x			O		G
Bachman (1992)	5		x				x										x						1	55	86-87	2,3	x			P		G
Barker (1999)	4		x									x			x							x	1	138	1995	1	x			P		G
Barnett (1997)	1		x														x	x					98	38863	89-90	2	x			P		V
Barnett (1999)									x								x											x	H	O		
Barnett (2001)	2								x																			x		O		
Berkowitz (1996)	1				x													x					7	1593	91-93	2			W,C	P		F,P
Bickman (1996)*												x															x		x	P		G
Blose (1991)	1		x		x			x							x			x				x		2259	74-87	1			H	A		G
Booth (1997)	3	x	x				x	x				x						x		x			172	85000	1987	1			H	A		M,V
Brent (1998)*																								1689	77-81	4			P	A		G
Bury-Maynard (1999)*																												x		P		G
Daley (2000)	1			x	x	x			x								x	x	x				62	439	92-97	2			C	P		F
Daley (2001)	1			x	x	x		x	x						x		x	x	x				8	445	92-97	1	x			P		MA,F
DeHart (1993)*																											x		H	A		A
Deschenes (1991)	1								x									x						279	78-79	3			C	O		M,R

EXHIBIT A-1 (CONT.)

COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

Study		Level/Modality of Care														Type of Cost Estimate							Data				Type of Outcome/ Benefit			Clients		
First Author (Year)	Study Design/Comparison	Hosp. Inpt. Detox.	Hosp. Inpt. Rehab.	Resid. Detox.	Resid. Rehab	Outpt. Detox.	Intensive Outpt (or "day")	Standard Outpt.	Outpt. Opiate Substitution	Other Medication	Independent Practioner	Specified Adjunct Component	Self Help (e.g., AA, CA, NA)	Continuing Care (incl. Aftercare)	Ins. Reimbursements	Episode - Completed	Episode - Average	Day of Care (24 hrs./ "Slot Cost")	Week/Day Enrolled (Ambulatory)	Encounter/Visit (Ambulatory)	Specified Units of Service	Covered Reimbursements	# of Providers	# of Clients	Year(s) of Data	Source of Cost Data	Success/Improvement	Quality/Disability Adjusted Life Yrs.	Economic Value	Poly or Single Substance	Comorbid SA/MH	Demographic
Fals-Stewart (1997)	5							x				x					x				x			80	91-93	2,3,4	x		H,C,W	P		M,A
Fink (1985)	5		x				x										x						1	115	79-81	2,3	x			A		G
Flynn (1999)	1				x			x									x		x				19	502	1992	2,3			C	C		G
French (1991)	2				x			x	x										x				41	2420	79-81	3			P	P		G
French (1992)*	2				x				x																				P	P		G
French (1999)	2				x													x			x			342	1994	2,3	x			P	x	G
French (2000)[2]	3				x		x							x			x							263	97-99	1,4			H,P,O	P		G
Gerson (2001)	4	x	x					x							x		x	x				x		3168	93-94	1			H	P		MA
Gerstein (1994)	1				x	x		x	x								x	x	x				97	2000	91-92	2			H,C,P,W	P		G
Goodman (2000)	1		x					x							x			x	x	x		x		4856	80-87	1			H	A		M
Griffith (2000)*	4				x											x											x			P		P
Harwood (1988)	3				x			x	x								x	x	x				41	2420	79-81	2,3			C	P		G
Harwood (1998)*	1				x			x	x								x	x	x					1825	1992	2			H,C,P,W	P		F
Harwood (2000)	1		x		x		x	x		x							x						71	4411	90-91	3			H,C,P,W	P		G
Hayashida (1989)	5	x				x											x							164	85-87	1	x			A		M,V
Holder (1981)*	1														x							x				1			H	A		G
Holder (1986)[1]	1														x							x		1697	80-83	1			H	A		G
Holder (1986)[2]	1														x							x		245	74-79	1			H	A		G
Holder (1987)[2]	1														x							x		1645	80-83	1			H	A		G
Holder (1992)[1]	1														x							x		3729	80-87	1			H	A		G

EXHIBIT A-1 (CONT.)
COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

Study		Level/Modality of Care														Type of Cost Estimate							Data				Type of Outcome/ Benefit			Clients		
First Author (Year)	Study Design/Comparison	Hosp. Inpt. Detox.	Hosp. Inpt. Rehab.	Resid. Detox.	Resid. Rehab	Outpt. Detox.	Intensive Outpt (or "day")	Standard Outpt.	Outpt. Opiate Substitution	Other Medication	Independent Practioner	Specified Adjunct Component	Self Help (e.g., AA, CA, NA)	Continuing Care (incl. Aftercare)	Ins. Reimbursements	Episode - Completed	Episode - Average	Day of Care (24 hrs./ "Slot Cost")	Week/Day Enrolled (Ambulatory)	Encounter/Visit (Ambulatory)	Specified Units of Service	Covered Reimbursements	# of Providers	# of Clients	Year(s) of Data	Source of Cost Data	Success/Improvement	Quality/Disability Adjusted Life Yrs.	Economic Value	Poly or Single Substance	Comorbid SA/MH	Demographic
Holder (2000)	5							x				x			x		x		x	x		x	3	279	93-95	2			H	A		G
Hughey (1996)	4						x										x						1	260	91-93	2			C	P		P
Humphreys (1996)	3							x					x				x							201	84-89	3	x		H	A		G
Humphreys (2001)	2		x									x	x				x						10	1774	96-98	1	x		H	P		V
Jerrell (1996)	5											x	x								x			132	90-91	1,2,4			H,C,W	P	x	G
Kashner (1992)	5		x												x		x					x		137	87-89	1	x		H	A		V
Koenig (1999)	1				x		x	x	x								x	x	x				72	5264	93-95	2,3			H,C,P,W	P		G
Koenig (2000a)[1]	1				x			x									x	x	x				72	4411	93-95	2,3			H,C,P,W	P		G
Koenig (2000b)[2]	1				x			x									x	x	x				72	3065	93-95	2,3			H,C,P,W	P		G
Kraft (1997)	5								x			x					x	x			x		1	100	1991	2	x			O		G
Lee (1998)*	2							x				x										x		102					H	P	x	G
Lennox (1993)	1														x							x		690	80-87	1			H	A	x	G
Lessard (1985)	1		x														x						1	190	<85	3			H,C,W	A		G
Lo (1993)	3	x	x			x		x							x							x	111	2928	82-85	1			H	A		MC
Longabaugh (1983)	5		x				x										x							174	79-80	1,2,3	x			A		G
Lu (1998)*								x																						P		G
Machado (2001)								x									x			x			38		91-94	2	x			P		G
Maddox (1996)*	1											x					x						20				x		C	P		P
Mauser (1994)	1	x	x		x			x				x				x		x					1	259	90-91	2,3			H	P		G
McCrady (1986)	5		x				x										x	x						174	<83	2	x			A		G

EXHIBIT A-1 (CONT.)

COST EFFECTIVENESS AND COST BENEFIT STUDY CHARACTERISTICS

Study		Level/Modality of Care													Type of Cost Estimate							Data				Type of Outcome/ Benefit			Clients		
First Author (Year)	Study Design/Comparison	Hosp. Inpt. Detox.	Hosp. Inpt. Rehab.	Resid. Detox.	Resid. Rehab	Outpt. Detox.	Intensive Outpt (or "day")	Standard Outpt.	Outpt. Opiate Substitution	Other Medication	Independent Practioner	Specified Adjunct Component	Self Help (e.g., AA, CA, NA)	Continuing Care (incl. Aftercare)	Ins. Reimbursements	Episode - Completed	Episode - Average	Day of Care (24 hrs./ "Slot Cost")	Week/Day Enrolled (Ambulatory)	Encounter/Visit (Ambulatory)	Specified Units of Service	Covered Reimbursements	# of Providers	# of Clients	Year(s) of Data	Source of Cost Data	Success/Improvement	Quality/Disability Adjusted Life Yrs.	Economic Value	Poly or Single Substance	Comorbid SA/MH	Demographic
Mecca (1997)	1				x			x	x															1990	1992	3			H,C,P,W	P		G
Miller (1980)	5										x										x			41	<80	NS	x			A		G
O'Farrell (1996)[1]	5										x	x					x			x	x		1	59	1992	2	x		H	A		M
O'Farrell (1996)[2] *	5										x	x					x			x	x			36	1992	2	x		H	P		G
Pettinati (1999)	3		x					x				x	x				x						1	173	88-92	2	x			A		G
Rajkumar (1997)*	1																							2420					C,O	P		G
Reiff (1981)	1		x					x							x							x		137	75-76	1			H	A		G
Reutzel (1987)	1														x			x				x		46	1983	1			H	A		MA
Rosenheck (2001)	2								x											x	x						x			O		G
Schinka (1998)	5		x		x												x		x				1	98	1996	2	x			P		V
Schneider (1996)	5				x		x						x			x	x	x	x				2	74	90-93	2	x			C		G
Schoenwald (1996)	5							x									x	x			x			118	93-95	2			H,C	P		T,P
Shepard (1997)*	1				x			x									x						1	2941	93-95	3	x			P		G
Svikis (1997)	4				x		x					x					x	x					2	146	91-92	2	x		H	P		F
Vaughn (1998)*	5		x					x				x															x			P		G
Weisner (2000)	5						x	x									x						1	688	93-97	2	x			P		G
Worner (1993)	2														x			x				x		123	90-92	1			H	P		W
Yu (1991)	2														x			x				x		327	85-89	1			H	P		W
Zaric (2000)									x																	2,3,4		x		O		G
Zywiak (1999)	1		x				x	x								x	x	x						5434	NS	3	x		H	P		G

* = Could not locate publication. Coding based on electronic abstract.

1,2 = Studies published by the same first author in the same year, the superscript indicates the order that it appears in the bibliography.

EXHIBIT A-2
KEY TO ABSTRACTION AND CODING OF THE LITERATURE

Study Characteristic	Key to Coding of Characteristic
Study design/comparison population (only if cost effectiveness, cost benefit)	1: Non-randomized pre-post single type of care/population 2: Non-equivalent populations (same level of care, different approaches) 3: Non-equivalent populations (different levels of care) 4: Non-equivalent populations (treated versus untreated) 5: Random assignment A blank indicates that the information was either not applicable to the study type (methodology or literature reviews) or this information was not provided in the document.
Level(s)/modality of care studied	An "x" is indicated for each of the following types/levels of care examined in the study Hospital inpatient detoxification Hospital inpatient rehabilitation Residential detoxification Residential rehabilitation Outpatient detoxification Intensive outpatient (or "day") Standard outpatient Outpatient opiate substitution (methadone, LAAM, buprenorphine) Other medication Independent practitioner Specified adjunct component (e.g., family, mental health) Self help (AA, CA, NA) Continuing care/aftercare Insurance reimbursements: services covered under insurance, generally includes a range of the above levels/modalities of care
Type of cost data/ estimates	An "x" is indicated for each of the following types of cost data/estimates in the study Episode-completed Episode-average Day of care (for inpatient)/"slot costs" Week/day enrolled (for ambulatory) Encounter/visit (for ambulatory) Specified units of service (for inpatient or ambulatory) Covered reimbursements: data from insurance claims or provider data on client
Number of providers	# providers for/from which cost data were obtained
Number of clients	# clients for whom treatment cost data were available from claims or client survey
Year(s) of data	Calendar year in which data were collected NS= Study did not provide this information.

EXHIBIT A-2 (CONT.)
KEY TO ABSTRACTION AND CODING OF THE LITERATURE

Study Characteristic	Key to Coding of Characteristic
Source of cost data	1: Insurance claims for utilization of treatment 2: Provider cost data 3: Survey data collected from client 4: Other data
Success/improvement	An "x" is indicated if the study assessed outcomes based on achievement of or improvement on a specific criterion
Quality/disability adjusted life years	An "x" is indicated if the study assessed outcomes using either quality adjusted life years (QALY) or disability adjusted life years (DALY)
Economic value: types of values for which a cost benefit study estimates benefits:	H: Health C: Crime and criminal justice W: Welfare P: Productivity
Focus on clients: Type of Drug Studied	P: Polysubstance clients (includes clients with unspecified or multiple problems) A: Alcohol dependent/abusing clients O: Opiate dependent/abusing clients C: Cocaine dependent/abusing clients x: Indicates co-occurring (substance abuse and mental health)
Demographic Characteristics of Study Population	G: General (not specified as any of the following) M/F: Males or females, respectively T: Teenage/adolescents (under 18 years) A: Adults (18 to 64 years) E: Elders (65 years and over) R: Race/ethnic group a particular focus P: Prisoners treated while incarcerated V: Veterans served by Veterans Administration facilities W: Workers served under workplace insurance MC: Medicare insured population MA: Medicaid insured population
Conclusion/results of analysis	A brief synopsis of the main findings of the study, characterizing the cost-effectiveness or cost benefits of treatment or various approaches

APPENDIX B
COMPARISON OF TREATMENTS, OUTCOME MEASURES AND FINDINGS

APPENDIX B
COMPARISON OF TREATMENTS, OUTCOME MEASURES AND FINDINGS

The coding scheme used for Exhibit B-1 is provided after the exhibit.

EXHIBIT B-1
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Alfano (1987)	1	Single population: Hospital inpatients with individualized treatment plans	Tax dollars generated from earnings through employment post-discharge	Through 18 months after treatment discharge
	Based on ratio of costs of treatment to total tax dollars generated from earnings after discharge, the program becomes cost effective at 13.25 months following discharge.			
Alterman (1994)	5	Intensive outpatient versus inpatient rehabilitation for cocaine dependence	Addiction Severity Index, urine data, wages lost, re-entry into substance abuse treatment, abstinence	7 months post - admission
	More patients completed inpatient than day hospital treatment, but no group differences were shown in other outcomes. Inpatient treatment costs were 1.5 to 3.0 times those of day hospital treatment.			
Avants (1999)	5	Day treatment versus enhanced standard care for treatment of opioid-dependent patients maintained on methadone	Opiate or cocaine use, Addiction Severity Index, drug-related problems, HIV risk, health care, criminal justice, vocational and legal services	6 months post- treatment
	The enhanced methadone maintenance program produced results comparable to an intensive day treatment program at less than half the cost.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Bachman (1996)	5	Intensive outpatient versus hospital inpatient rehabilitation	Addictions Severity Index (ASI), Beck Depression Inventory (BDI), client satisfaction	Up to 18 months post-discharge
	Intensive outpatient treatment is at least as effective as and less expensive than traditional inpatient care at up to 18 months after discharge.			
Barker (1999)	4	Hospitalized patients with specific diagnoses who received a substance abuse consultation versus patients with the same diagnoses, who did not receive a consultation.	Readmission to inpatient hospital	12 months post-admissions
	Consultation did not result in greater short-term benefits or reduced costs. Evidence appears to indicate that patients receiving a consult were less likely to have a readmission following consultation.			
Barnett (1997)	2	Inpatient treatment: 21 vs. 28 length of stay; size of provider; staff-to-patient ratio	Readmission to hospital	6 months post - discharge
	Programs that were smaller have a longer intended length of stay, conducted assessments of the patient's family and friends and those with compulsory admissions resulted in lower readmission rates. Nonetheless, a shorter length of stay, the consolidation of smaller programs, and a reduction of the staff-to-patient ratio are strategies to maximizing cost effectiveness.			
Barnett (1999)	5	Life span and treatment cost for opiate users with access to methadone treatment versus drug-free opiate treatment.	Cost per life-year gained (not quality adjusted).	To end of life.
	Providing opiate addicts with access to methadone maintenance has an incremental cost effectiveness ratio of $5,915 per life-year gained, compared with drug-free opiate treatment.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Barnett (2001)	5	Buprenorphine maintenance therapy compared with methadone maintenance therapy and no treatment for an HIV population with opiate addiction.	QALYs gained.	To end of life.
	Cost effectiveness ratios for buprenorphine maintenance therapy are between $45,000 and $60,000 per QALY gained, depending on the cost of a dose of the buprenorphine, compared with methadone maintenance therapy.			
Berkowitz (1996)	1	Single population: Female offenders enrolled in mandated program as an alternative to treatment in incarceration	Avoided costs to criminal justice system (incarceration cost, substance abuse treatment in prisons)	6 months after treatment initiation.
	Cost savings to criminal justice system were $2,961 per female prisoner. Mandated female offenders had higher rate of treatment completion than women voluntarily enrolled.			
Blose (1991)	1	Single population: Treated alcoholics	Change in health care service utilization and costs	6 years following treatment initiation
	Post-treatment utilization differed according to gender, but did not differ by age. When compared to non-alcoholics of the same age and gender, alcoholics had higher post-treatment average costs, with the gap between the two groups narrowing over time.			
Booth (1997)	2	Completed inpatient treatment versus incomplete inpatient treatment, AND extended detoxification versus short detoxification	Change in health care service utilization.	3 years following treatment initiation
	All groups followed the general pattern of an increase during the post-treatment period from the pre-index period, which was followed by decreased utilization at the end of the post-index period. Patients with completed histories of formal inpatient treatment had the highest increase of inpatient utilization followed by extended detoxification, incomplete treatment, and short detoxification. Focused treatments may not be able to achieve longer term better outcomes and lower costs.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Daley (2000)	1	Single population: Criminally-involved pregnant women enrolled in publicly-funded programs	Costs of crime: (criminal justice costs victimization costs, and impaired productivity due to incarceration)	At average of 202 days post-intake
	All modalities of care paid for themselves up to two times by reducing criminal involvement of clients.			
Daley (2001)	3	Residential versus outpatient versus residential/outpatient versus methadone versus detoxification-only	Medicaid claims, birth records	At delivery and hospital discharge
	There was a near-linear relationship between newborn birth weight and the intensity of treatment during pregnancy. Outpatient programs were the most cost effective of the options.			
Deschenes (1991)	1	Methadone maintenance	Narcotics use, criminal activity, economic and employment status, and legal supervision	Average 6.6 years post-admission
	Offense rates and related social and economic costs were lower before and after periods of addiction (corresponding to periods enrolled in methadone).			
Fals-Stewart (1997)	5	Husbands entering outpatient treatment assigned to behavioral couples therapy integrated into individual-based treatment (IBT) versus IBT alone	Utilization of substance abuse treatment, criminal justice system costs, income from illegal sources, support from public assistance, abstinence, ASI	1 year following treatment
	Behavioral couples therapy with IBT proved more effective than IBT alone. Men receiving behavioral couples therapy incurred significantly reduced social costs while the costs of the two treatment approaches were essentially identical.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Fink (1985)	5	Intensive outpatient versus hospital inpatient alcohol treatment	Drinking behavior, employment, residential status, arrests, psychosocial functioning and well-being, rehospitalization	24 months post-admission
	Differences in clinical outcomes between the two treatments were insignificant, but the intensive outpatient treatment costs are significantly less and are therefore more cost effective.			
Flynn (1999)	1	Single population: Cocaine-dependent patients in residential and outpatient drug-free treatments	Costs of crime (victim, criminal justice system, and crime career costs)	For 12 months following treatment discharge.
	Both modalities of care had cost benefit ratios of about 2, indicating reductions in costs of crime before to after treatment more than paid for cost of treatment.			
French (1991)	2	Length of stay in methadone, residential, and outpatient treatment modalities	Legal earnings post-treatment	12 months after treatment discharge.
	Length of stay in treatment had small positive effect on follow-up employment and earnings.			
French (1992)**	2	Length of stay in methadone, residential, and outpatient treatment modalities	Legal and illegal earnings post-treatment	12 months after treatment discharge
	Length of stay in treatment had small positive effect on legal earnings and small negative effect on illegal earnings post-treatment.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
French (1999)	3	Modified therapeutic community versus "treatment-as-usual" for homeless mentally ill chemical abusers	Substance use, criminality, HIV-risk behavior, psychological dysfunction (BDI, SMAS, SCL 90-R Global Severity Index, TSCS), employment	12 months post admission
	Patients treated in the modified therapeutic community experienced lower levels of alcohol intoxication, criminality, and depression than those in the treatment-as-usual group, and incurred a lower cost of treatment. Therapeutic community is a cost effective alternative.			
French (2000)[2]	1	Full continuum care (inpatient) and. partial continuum care (intensive outpatient)	Dollar-equivalent values for: days of med/psych problems, days in med/psychiatric treatment, employment, $ spent on substance use, days engaged in criminal activity	9 months post-intake
	Both continua generated treatment benefits significantly higher than treatment costs. Each dollar invested in full continuum care yielded an average of $9.70 in economic benefit to society, while each dollar spent on partial continuum care yielded an average of $23.33 of economic benefit (but was not statistically significant).			
Gerson (2001)	4	Treated versus Diagnosed but Untreated Substance Abusers	Change in health care service utilization	1 year following treatment initiation
	Post-treatment health care costs of untreated Medicaid enrollees with substance abuse problems were 85 percent (proportionally) more costly to Medicaid and were higher users of services than treated substance abusers. The cost of treating substance abuse patients substantially offsets the high cost of not treating substance abusers.			
Gerstein (1994)	1	Single population: Patients enrolled in publicly-funded substance abuse treatment programs in California	Costs avoided due to reductions in burden of crime and illness and shifts in income sources	At an average of 15 months post-treatment discharge

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	Benefits to total society outweighed costs of treatment by ratios from 2:1 to more than 4:1 for all treatment types, except methadone treatment episodes ending in discharge, depending on type of treatment. Cost benefit ratios for taxpaying citizens were higher, ranging from 4:1 to greater than 12:1, depending on type of care.			
Goodman (1997)	1	Single Population: Treated Alcoholic and Treated Drug Abusers	Change in health care service utilization and costs	1.25 years following treatment initiation
	Alcoholism and drug abuse treatment costs increase .51 percent within 6 months of treatment initiation with inpatient treatment account for the largest portion of the cost increase.			
Goodman (2000)	1	Single population: Treated Alcoholics	Change in health care service utilization and costs	Extended period of time following treatment initiation
	The alcoholic group utilized more services and costs before, during, and after treatment initiation than the matched non-alcoholic group. Cost offset emerged only for alcoholics without mental psychosis comorbidities.			
Griffith (2000)**	4	In-prison treatment versus untreated; in-prison TC with community-based transitional TC post release versus in-prison treatment only	Recidivism	1- and 3-year post-treatment
	It is cost effective to offer the intervention to individuals who complete the entire treatment regimen, particularly those who are classified as high-risk.			
Harwood (1988)	2	Length of stay in three modalities of care (residential, outpatient methadone, and outpatient drug free)	Reduction in crime-related costs (victim, criminal justice system, and crime career/productivity costs)	For 12 months following treatment discharge

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	Increased length of stay in each of three modalities yielded economic benefits (reduction in crime-related costs) for society and law-abiding citizens from drug abuse treatment. Benefits compared favorably with the cost of an additional day of care in each modality. Residential and outpatient methadone had higher ratios of benefits to costs for law-abiding citizens (3.84:1 and 4.04:1, respectively), and outpatient drug free had higher benefits to cost ratios for society (4.28:1).			
Harwood (1998)**	1	Single population: Men and women in publicly-funded substance abuse programs in California	Health care and criminal costs savings	12 months post-treatment discharge
	Cost savings from treatment for men were 9.3 times the cost of treatment, and savings for women were 4.3 times the cost of treatment. Cost savings from treatment were 4 to 12 times greater than the cost of treatment, depending on the treatment modality.			
Harwood (2000)	1	Single population: Treated Substance Abusers in Federally funded treatment programs (demonstrations)	Change in health care service utilization, crime, and productivity costs	1 year after discharge from treatment
	Benefits for the correctional population were 15 times greater than treatment costs, and 2 times greater for community treatment. Reductions in crime related costs accounted for 90 percent of the economic benefits, with only modest savings from health costs and earnings.			
Hayashida (1989)	5	Outpatient detoxification versus inpatient detoxification	Addiction Severity Index, entry into long-range rehabilitation programs, incidence of redetoxification	Up to 6- months post-treatment
	At six months, no significant differences between groups were found with respect to any of the outcomes. Inpatient detoxification is 9 to 20 times more expensive than outpatient. Outpatient detoxification is the cost effective alternative.			
Holder (1986)[1]	1	Single population: Treated Alcoholics utilizing inpatient treatment with outpatient follow up	Change in health care service utilization and costs.	3 years following treatment initiation.
	The total health cost sharply increased prior to treatment, dramatically decreased in the six months following treatment and continued to fall there after.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Holder (1986)[2]	1	Single Population: Treated Alcoholics and their families	Change in health care service utilization costs for substance abuse patient and their family	5 years following treatment initiation
	Treatment of alcoholism lead to significant post-treatment period reductions in service utilization and total health care costs, reaching a level similar to the matched population. Total health care costs per family member also decreased.			
Holder (1987)[1]	1	Single population: Treated Alcoholics	Change in health care costs	3 year following treatment initiation
	The costs of alcoholism treatment can be offset by subsequent health care reductions by the third year of the post-treatment period.			
Holder (1992)	4	Treated versus Untreated Alcoholics	Change in health care costs.	4 years following treatment initiation.
	Post-treatment heath care cost of treated alcoholics were 24 percent lower than untreated alcoholics. Alcoholism treatment can reduce total health care costs in a heterogeneous alcoholic population.			
Holder (2000)	5	Patients randomly assigned to one of three approaches to ambulatory care	Medical care cost savings (inpatient care, outpatient care, and total medical care costs)	For 2 years post-treatment discharge
	Overall, total medical care costs declined pre- to post-treatment for each approach. Patients with good prognostic characteristics had better medical cost-savings with motivational enhancement therapy (MET), while patients with poorer prognostic characteristics had better cost-savings with cognitive behavioral therapy (CBT) and/or twelve-step facilitation (TSF).			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Hughey (1996)	4	Jail-based drug and alcohol program: treated versus untreated prisoners	Recidivism (re-arrest)	5 year post- release
	The short-term treatment program for inmates with substance abuse problems resulted in lower rates of re-arrest compared to similar inmates not getting treatment. Large savings due to lower rates of re-incarceration make the program cost effective.			
Humphreys (1996)	3	Patients initially utilizing Alcoholics Anonymous versus Ambulatory Outpatient treatment	Change in health care service utilization and costs.	3 years following treatment initiation.
	Though outcomes for Alcoholics Anonymous (AA) and Outpatient treatments were similar throughout the 3-year post-treatment period; those patients initially opting to utilize AA over outpatient treatment may reduce treatment and offset health care costs by utilizing less formal treatments over the post-treatment period.			
Humphreys (2001)	2	Inpatient 12-step programs versus inpatient cognitive-behavioral (CB) inpatient treatment	Abstinence, substance-abuse related problems, psychological distress, psychiatric symptoms, mental health care utilization	1 year post-admission
	Treatment in a 12-step program predicted greater frequency of self-help group attendance, talking with a sponsor, a significantly lesser utilization of mental health care and a higher rate of abstinence. 12-step treatment represents a cost effective treatment strategy.			
Jerrell (1996)	3	Severely mentally ill substance abusers getting: 12-Step Model, versus Behavioral Skills Model, versus Intensive Case Management Model.	Change in mental health and substance abuse treatment service utilization, health care, crime, and welfare costs	1.5 years following treatment initiation

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	The cost reduction ratio over the post-treatment period for the 12-Step Model was $9. It was $.53 for the Behavioral Skills Model , and $8.89 for the Management Model. Overall, dual mental health and substance abuse treatment resulted in cost savings of over 40% during the post-treatment period, with the 12-Step and Behavioral models having the most cost impact.			
Kashner (1992)	5	Patients randomly assigned to an older alcoholic rehabilitation (OAR) program versus a traditional (confrontational) care program	Medical care cost savings (both alcoholism and nonalcoholism costs) incurred and abstinence	After treatment initiation and 6 and 12 months post discharge
	Overall costs of the OAR program were lower than traditional care program and OAR patients were 2 times more likely to remain abstinent at 6 and 12 months post-discharge.			
Koenig (1999)	1	Single population: NTIES patients who received various treatment modalities	Avoided crime-related, health care costs, and welfare payments, and increased earnings	12 months post-treatment discharge
	Benefits outweighed total costs to society by ratio of 3.1:1 and to non-treated population by ratio of 4.2:1.			
Koenig (2000b)	2	Increased length of stay and treatment intensity in residential and outpatient treatment programs	Costs of additional day of treatment and avoided crime-related, health care costs, and welfare payments and increased earnings and taxes	At treatment discharge and 12 months post-treatment discharge
	Marginal benefits from an additional day of treatment due to reductions in post-treatment costs were an average $21 per patient for short-term residential treatment, $13 for outpatient drug-free, and $5 for long-term residential treatment.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Kraft (1997)	5	Minimum versus standard (moderate) versus enhanced methadone therapy	Addiction Severity Index, Treatment Services Review, urine screening	6 months post-treatment.
	Enhanced methadone therapy clients showed significantly better outcomes at 24 weeks post-treatment but at 12 months, only the difference in level of abstinence from heroin was statistically significant. Minimum methadone therapy had poorest outcomes. A moderate level of support services would prove more cost effective than enhanced levels of additional services.			
Lennox (1993)	1	Single Population: Alcoholics with depression and Alcoholics without depression	Change in health care costs.	3 years following treatment initiation.
	During the post-treatment period, depression-complicated patients incurred higher health care costs and did not experience total health care cost reductions (unlike those without depression).			
Lessard (1985)	1	Single population: Clients receiving treatment for chemical dependency	Reduction in health care and crime-related costs and clients receiving welfare	6 months post-treatment discharge
	There was a 49% payback of treatment costs withing 6 months, when only reduction of arrests, health care utilization, and receipt of welfare benefits were measured.			
Lo (1993)	3	Freestanding residential/detoxification facilities versus Hospital-based facilities	Change in health care service utilization and costs	4 years following treatment initiation.
	Number of admissions to the facility, the average length of stay, and the average monthly health expenditures following the initiation of treatment are lower for patients treated in freestanding clinics than hospital facilities.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Longabaugh (1983)	5	Extended inpatient hospitalization versus partial hospitalization for alcoholism treatment	Alcohol use, problem status, hospitalization, incarceration, employment, residential status	Up to 6 months post-treatment
	Most outcomes for partial hospital patients were the same as outcomes for those treated by extended inpatient. Partial hospital treatment costs less, so it is cost effective relative to extended inpatient hospitalization.			
Machado (2000)	2	Outpatient drug-free lower versus higher expenditures per client day	Abstinence 1 month prior to discharge	1 month prior to discharge
	The marginal impact of expenditures per client on the abstinence rates of outpatient programs is not significantly different than zero.			
Maddox (1996)**	1	Single population: Defendants enrolled in drug court programs that provide drug treatment and monitored probation	Cost savings to criminal justice system (incarceration costs, reduced recidivism), abstinence	
	Cost savings from treatment included $5,000 in incarceration costs per defendant compared to treatments costs of $900 to $1,600 per defendant. Recidivism rates and drug use post-treatment were also reduced.			
Mauser (1994)	1	Single population: Drug-dependent offenders diverted from justice system into treatment	Reduction in health care and criminal justice system costs and increase in productivity	6 and 20 months post-intake
	Costs of treatment per day ranged from $54 to $137 and corresponding cost benefit ratios ranged from 1.4:1 to 3:1, depending on the cost of jail time.			
McCrady (1986)	5	Partial hospital treatment versus extended inpatient rehabilitation	Drinking behaviors, re-hospitalization, psychological and social functioning	12 months post-treatment

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	The two settings resulted in no difference in clinical outcomes, but yielded significantly lower treatment costs for post detoxification partial hospitalization than extended inpatient. Partial hospital treatment is cost effective relative to extended inpatient rehabilitation.			
Mecca (1997)	1	Patients enrolled in publicly-funded substance abuse programs in California (results from Gerstein et al, 1994)	Reduction in health care and crime costs and reduction in substance use	15 month post-treatment discharge
	Benefits of substance abuse treatment programs outweighed costs of treatment by ratios ranging from 4:1 to greater than 12:1, depending on the type of treatment modality.			
Miller (1980)	5	Outpatients assigned to 4 types of behavioral training: bibliotherapy versus individual counseling versus individual counseling with relaxation training versus group therapy	Profile of Mood States, Goal Attainment Scaling, drinking pattern, blood sample for liver function	Up to 12-month follow-up
	No significant differences were found among the 4 types of behavioral self-control training evaluated. The bibliotherapy approach is cheaper than therapist-administered programs; thus the cost effectiveness of bibliotherapy was supported.			
O'Farrell (1996)[1]**	5	Married alcoholic patients in outpatient alcoholism treatment assigned to: behavioral marital therapy (BMT), versus interactional couples group, versus no marital therapy	Health care and legal system cost savings	For 2 years post-treatment discharge
	In combination with individual alcoholism counseling, behavioral marital therapy is more effective and cost effective than interactional couples therapy.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
O'Farrell (1996)[2]	5	Couples with newly abstinent alcoholic husbands who have undergone BMT randomly assigned to receive relapse prevention (RP) sessions versus no RP sessions.	Health care and legal system cost savings	For 12 months post-treatment discharge
	Health care and legal costs and abstinent days decreased more with RP. However, due to the high cost of RP, BMT alone was more cost effective.			
Pettinati (1999)	3	Inpatient versus outpatient treatment	Timeline Followback, alcohol consumption	3-, 6-, and 12-months post-treatment
	On average, outcomes were not significantly different. High-problem alcohol patients had better drinking outcomes with inpatient compared to outpatient treatment, especially in early recovery stages, but inpatient treatment is more costly.			
Rajkumar (1997)**	1		Crime and psycho-social effects on crime victims	
	Drug abuse treatment has the potential to reduce crime and the negative pyscho-social effects for crime victims. Reduced crime activity can increase dollar benefits.			
Reiff (1981)	4	Alcoholics participating in HMO outpatient treatment programs versus untreated	Change in health care service utilization and costs.	3 years following treatment initiation
	Health care cost for patients participating in outpatient treatment programs decreased $144 per patient per year, while cost for those in the non-participating group increased by $457 per patient per year for the 3 years in the post-treatment period.			
Reutzel (1987)	1	Single population: Substance Abusers	Change in health care service utilization and costs.	6 months following treatment initiation
	Post-treatment expenditures are lower than pre-treatment; total Medicaid health care expenditures did not increase during the post-treatment period.			

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
Rosenheck (2001)	–	Office administered burenorphine maintenance therapy versus methadone maintenance treatment in federally regulated clinics.	Projected costs of burenorphine and methadone maintenance treatment.	1st year and subsequent years of treatment
	A review of studies suggests that buprenorphine/naloxone therapy is not likely to be any more or less effective than methadone maintenance for opiate addiction.			
Schinka (1998)	3	Inpatient treatment versus supportive housing setting with intensive outpatient treatment	Breath analysis and urine testing at follow-up	60-day post-treatment
	Relapse rate did not differ by treatment group, but supportive housing with day treatment cost significantly less per successful treatment.			
Schneider (1996)	5	Inpatient versus day-treatment	Addictions Severity Index, abstinence	Up to 6-months post-treatment
	Both types of treatment resulted in comparable improvement and similar rates of abstinence at the six-month follow-up. Day treatment cost per abstinent patient is 41% that of the abstinent inpatient. Day treatment is cost effective relative to inpatient treatment.			
Schoenwald (1996)	5	Juvenile substance abusers in home: multi-systemic therapy (MST) versus usual services	Change in health care service and incarceration costs.	1 year following treatment referral
	MST reduced incarceration by 46 percent and adjudicated arrests by 26%. MST cost 50% more for therapeutic services. This was largely offset by decrease in days incarcerated.			
Shepard (1997)	3	Substance abuse treatment services in the state of Ohio	Abstinence	Up to 12-months post-treatment

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	Regular outpatient treatment is most cost effective for mild and intermediate categories of frequency of use, while residential short-term rehabilitation is the most cost effective for high frequency users. Long-term rehabilitation is the least cost effective type of care.			
Svikis (1997)	4	Drug-abusing pregnant women enrolled in a multidisciplinary treatment program at time of delivery versus those not enrolled	Reduction in health care costs (NICU costs)	At treatment discharge
	When total cost was examined (including drug treatment), there was a mean cost savings of $4,644 per mother/infant pair for the treatment group compared to the untreated group.			
Vaughn (1998)	5	Residential patients and outpatients were assigned to case management versus no case management	Addiction Severity Index scores, abstinence in last 30 days	6 months post- treatment
	Individuals in each type of treatment experienced significant but similar improvement in the ASI subscale scores at 6 months. Case management was not more cost effective.			
Weisner (2000)	5	Day hospital versus traditional outpatient programs in a managed care organization	Abstinence: total, from alcohol and from other substances	6 months post-admission or 4 months post-treatment
	No differences in average abstention outcomes were detected for day hospital versus outpatient treatment, although day hospital treatment was more effective for subjects with midlevel severity of psychiatric problems. Outpatient treatment costs substantially less per patient than day hospital treatment.			
Worner (1993)	2	Participation in workplace treatment for 3 groups: (I) Sought treatment and had no subsequent treatments; (II) Sought treatment but continued in subsequent years; (III) Declined treatment	Change in health care service utilization and costs	5 years following treatment initiation

EXHIBIT B-1 (CONT.)
TREATMENTS COMPARED, OUTCOME MEASURES, FINDINGS

First Author (Year)	Study Design *	Treatments/ Interventions Evaluated/ Compared	Nature of Effectiveness Measure(s)	When Outcome Assessed
	Health care costs for Group I were still less than pretreatment costs, Group II costs significantly increased 5 times the pre-treatment costs, and Group III increased 2.5 times the pre-treatment costs.			
Yu (1991)	2	Participation in Workplace treatment for 3 Groups: (I) Sought treatment and had no subsequent treatments; (II) Sought treatment but continued in subsequent years; (III) Declined treatment	Change in health care service utilization and costs	2 years following treatment initiation
	When compared to the pre-treatment period, during the post treatment period, Group I had 48% decrease in average health care cost, Group II has a 93% increase, and Group III had a 116% increase. Treatment cost decreased more with alcohol than drugs.			
Zaric (2000)	–	Increased methadone maintenance capacity in HIV prevalent communities.	QALYs gained.	10 year time horizon.
	Additional methadone maintenance capacity costs $8,200 ($10,900) per QALY gained in high (low) HIV prevalence communities.			
Zywiak (1999)	1	Single population: Substance Abusers	Change in health care service utilization	2 years following treatment initiation
	Patients who were abstinent during the post-treatment period had lower service utilization than those who had relapsed. There seems to be a correlation between gender, age, and type of treatment utilization (either medical or psychiatric), with women over 40 having the most dramatic offset effect.			

* 1=non-randomized pre-post single type of care/population; 2=non-equivalent populations (same level of care, different approaches); 3=non-equivalent populations (different levels of care); 4=non-equivalent populations (treated versus untreated); 5=random assignment; a hyphen ("-") indicates that the study design was not stated in the publication.

** = Could not acquire the publication due to time constraints. Coding based on electronic abstract.

1,2 = For studies published by the same first author in the same year, the superscript number corresponds to the order in which it appears in the annotated bibliography.